Airplane Flight Manual (AFM) and Pilot's Operating Handbook (POH)

Session Time: One, 50-minute session

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

A deep understanding of how an aircraft operates, which enables a pilot to fly an aircraft to its maximum capabilities in both normal and abnormal situations. (EU 5)

ESSENTIAL QUESTIONS

1. An iPad is a complex electronic device that doesn't come with an owner's manual. How would you design an aircraft so that it didn't need an owner's manual?

LEARNING GOALS

Students Will Know

- What an AFM/POH is and what types of information it contains
- How all AFM/POH's are organized in a similar fashion

Students Will Be Able To

- *Use* a POH to find specific information about an aircraft. (DOK-L1) and *draw conclusions* about how they can operate the aircraft safely (DOK-L3)
- *Assess* situations to answer questions using the POH. (DOK-L3).

ASSESSMENT EVIDENCE

Warm-up
Students will create and compare lists of products that do and do not come with operating instructions, then discuss the role and value of instruction manuals in general and for aircraft specifically.

Formative Assessment
Students will answer a series of questions about the design, role, and use of an AFM/POH.

Summative Assessment
Students will use a POH to find information and answer critical questions about the operation and performance of a Cessna 172S aircraft.

LESSON PREPARATION

MATERIALS/RESOURCES

- AFM and POH Presentation
- AFM and POH Student Activity 1
- AFM and POH Student Activity 2
- AFM and POH Teacher Notes 1
- AFM and POH Teacher Notes 2
- AFM and POH Teaching Aid
- **A copy of a Pilot's Operating Handbook/Airplane Flight Manual (Available at http://wayman.net/files/C172S-G1000-POH.pdf or by searching "Cessna 172S POH")**

Teaching Tips

You will need to prepare a copy of an actual Pilot's Operating Handbook/Airplane Flight Manual for students to complete this lesson's assessments. Depending on the number of devices available, consider directing students to view the document online rather than printing a copy for each student.

If possible, have a few other copies of a POH/AFM for other aircraft available so that students can see how all flight manuals are organized in a similar fashion.

LESSON SUMMARY

Lesson 1: Airplane Flight Manual (AFM) and Pilot's Operating Handbook (POH)
Lesson 2: Registration and Airworthiness Certificates
Lesson 3: Inspections

This lesson begins with a warm-up in which students are prompted to think of the role of instruction manuals, and consider why an aircraft might need such a manual. Students then learn what the Pilot's Operating Handbook (POH) and Airplane Flight Manual (AFM) are and how they are used by pilots. Students will also learn about special circumstances in which these documents may not exist and the pilot's role in complying with the information contained in these documents as well as placards and markings in the aircraft.

Students then learn how they can determine if they are using the correct documents for their aircraft and whether or not the information they have is complete and up to date.

Next, the lesson reviews the key sections of the POH/AFM which are dictated by regulation. Each modern POH and AFM must contain specific sections and those sections must contain particular types of information related to the safe operation of the aircraft.

In the formative assessment, students answer questions about the role and use of the POH. They go on to perform a short activity in which they navigate a single section of the POH and report on their findings, leading to a discussion of what information is most important in each section.

Finally, students review FAA Private Pilot Knowledge Test questions before completing the summative assessment in which they use an actual POH to find critical information about an aircraft.

BACKGROUND

An Airplane Flight Manual (AFM) is developed by the aircraft manufacturer and must be approved by the FAA. It contains the information and instructions needed to safely operate the aircraft. An AFM is specific to an individual aircraft. It contains the operating procedures and limitations of the aircraft. Federal Aviation Regulations state that the AFM must be kept aboard the aircraft and that pilots must comply with the operating limitations specified in the approved flight manuals, markings, and placards.

Originally, an AFM could follow any format and contain any content the manufacturer thought was appropriate, but that is no longer true. Today, there is a standardized format for all general aviation flight manuals.

A Pilot's Operating Handbook (POH) typically includes FAA-approved AFM information. For most small aircraft built after 1975, the POH is also designated as the FAA-approved AFM. POHs contain the standardized information used in AFMs but may add additional sections as the manufacturer deems appropriate.

MISCONCEPTIONS

A POH might seem to be an unchanging document. It is in fact subject to revision as equipment is added or removed from the aircraft, airworthiness directives are issued, and issues arise regarding the construction or operation of the aircraft. That is why there is a Log of Effective Pages so that the owner, mechanics, and authorities can ensure that the POH is up to date.

DIFFERENTIATION

Divide the class into two sections, providing copies of POH page 1-5 and POH page 2-7 to each section. Assign students in one section the task of finding maximum Normal category landing weight and assign the other section the task of finding the Normal category center-of-gravity range at a weight of 1950 pounds. Have all students write down their results and share with students from opposite sections.

To support student motivation and comprehension in the **EXPLORE** section, play a game with students by giving them a scenario that requires them to reference the POH. Challenge students to find the correct section within the POH in the shortest amount of time.

LEARNING PLAN

ENGAGE

Teacher Material: AFM and POH Presentation

Slides 1-3: Introduce the topic and learning objectives of the lesson.

In this lesson, students will learn about what information is contained in the Airplane Flight Manual (AFM and) Pilot's Operating Handbook (POH).

Slide 4: Conduct the **Warm-Up**.

Warm-Up

Working as a class, create a list of five products that come with an instruction book and five that don't. Then ask students the following questions and make note of their answers.

How do the products in the two lists differ?
Possible responses might include: Products that don't have manuals are either more simple or more intuitive to use. In some cases, they may not have manuals because they have built-in assistance, such as tutorials, a built-in "help" file, or other means of providing information without a manual. Products that do have manuals may be more complex, more highly regulated, or may be more dangerous, requiring specialized safety information. They also may not have an alternative means of providing this information, for example tools or small appliances.

Do you consult your instruction books? Why or why not?
Answers will vary. There is no right or wrong response.

Why would an aircraft need an instruction book?
Answers might include its complexity, the uniqueness of each individual aircraft, regulations, and the importance of providing specialized safety information.

[DOK-L2: *Compare, Predict*]

EXPLORE

Teacher Material: AFM and POH Presentation

Slide 5: The Pilot's Operating Handbook (POH) or Airplane Flight Manual (AFM) is developed by the aircraft manufacturer. It is specific to a particular aircraft. It contains the information and instructions needed to safely operate the aircraft, including the operating procedures and limitations of that aircraft. The POH must be approved by the FAA.

Originally, an AFM could follow any format and contain any content the manufacturer thought was appropriate, but that is no longer true. Today, there is a standardized format for all general aviation flight manuals. (This will be covered in depth later in this lesson.) The POH typically includes FAA-approved AFM information. For most small aircraft built after 1975, the POH is also designated as the FAA-approved AFM. POHs contain the standardized information used in AFMs but may add additional sections as the manufacturer deems appropriate.

Federal aviation regulations state that the AFM must be kept aboard the aircraft.

Slide 6: Aircraft in the "Experimental" category and those with a Special light-sport airworthiness certificate may not have an AFM, so the operating limitations for these aircraft are attached to the airworthiness certificate. Also, most aircraft produced prior to 1979 do not have AFMs. (You may wish to note for students that more about airworthiness certificates will be explained in an upcoming lesson.)

Slide 7: While the AFM/POH is the main source of information about an aircraft's performance and limitations, pilots must use other sources as well. According to Title 14 of the Code of Federal Regulations (14 CFR) Part 91, pilots must comply with the operating limitations specified in the approved flight manuals, markings, and placards.

Slide 8: Even though every POH or AFM is customized for a specific aircraft, they all follow the same format. Introduce these flight manuals by starting with the title page. The specific aircraft's serial number and registration must appear on the title page. Explain that each POH/AFM is unique to an individual aircraft, including its specific weight and balance information as well as any equipment installed.

Slide 9: Point out that the airplane's POH may have been brought from the airplane into the airport to perform flight planning with the performance charts, and it is essential that it be returned to the airplane. In fact, checking for the presence of the POH aboard the plane is the first step in the Preflight Inspection. Explain that it is possible to get generic flight manuals that do not contain a serial number, but these are for general study purposes only.

Slide 10: At the beginning of the document, there is a log of effective pages and a date for each page. Every time there is a revision, the date of the revised page will be amended. As a pilot, you can always confirm that you have the most current page by cross-checking the date shown at the bottom of each page with the Log of Effective Pages.

Teaching Tips

If the POH is in a loose leaf binder, some pages may have been removed/lost, and this log of effective pages allows the pilot to confirm that the POH is intact.

EXPLAIN

Teacher Materials: AFM and POH Presentation, AFM and POH Teacher Notes 1
Student Material: AFM and POH Student Activity 1

Slides 11-13: Using this Table of Contents, introduce the main sections in a POH/AFM:

- Section 1 provides general information about the airplane, such as its dimensions and data about its components. It will also explain the meaning of certain abbreviations, symbols, and key terminology.
- Section 2 provides the aircraft's operating limits.
- Section 3 describes how to perform emergency procedures in the event of engine failure, forced landings, fire, ice, and other major issues.
- Section 4 describes how to perform normal operations, including preflight inspection, before takeoff, during takeoff, while flying, landing, and after landing.
- Section 5 contains performance data charts.
- Section 6 shows weight and balance considerations for proper loading.
- Section 7 describes the aircraft's various components, systems, and instruments.
- Section 8 explains how to inspect, repair, and perform routine maintenance on the aircraft.
- A final section may contain any supplemental information about optional equipment and its operating procedures.

Slide 14: Conduct the **Formative Assessment**.

Formative Assessment

In this activity, students will answer questions about an AFM/POH. Correct answers are provided in **AFM and POH Teacher Notes 1**.

[DOK-L2: *Summarize]*

EXTEND

Teacher Materials: AFM and POH Presentation, AFM and POH Teacher Notes 1
Student Material: AFM and POH Student Activity 1

Slide 15: Divide students into small groups and assign each group one section of the POH. Depending on the number of devices available, students can either view the sample POH online (http://wayman.net/files/C172S-G1000-POH.pdf) or each group can be provided with a printed copy of their section. Give students a few minutes to look through their section, then ask a spokesperson from each group to tell the class what information from their section is most important and why. Student responses will vary and there are no right or wrong answers.

EVALUATE

Teacher Materials: AFM and POH Presentation, AFM and POH Teacher Notes 2, AFM and POH Teaching Aid
Student Materials: AFM and POH Student Activity 2, AFM and POH Teaching Aid **(optional)**

Slides 16-19: Quiz students on these questions from the Private Pilot Knowledge Test.

Slide 20: Conduct the **Summative Assessment**.

Summative Assessment

In this activity, students will use an actual POH/AFM to assess questions and provide specific information. Provide a copy of **AFM and POH Student Activity 2** along with an electronic copy of a Cessna 172S POH. Sample student responses are provided in **AFM and POH Teacher Notes 2**.

[DOK-L3; *Assess*]

Summative Assessment Scoring Rubric

- Answers show evidence of the following:
  - Understanding of the function of a POH/AFM
  - Ability to find and interpret specific information in a POH/AFM

Points	Performance Levels
10	Answers no more than 1 question incorrectly.
8-9	Answers 2-3 questions incorrectly.
6-7	Answers 4-5 questions incorrectly.
0-5	Answers more than 5 questions incorrectly.

STANDARDS ALIGNMENT

COMMON CORE STATE STANDARDS

- **RST.9-10.1** - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- **RST.9-10.2** - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

- **RST.9-10.4** - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- **WHST.9-10.9** - Draw evidence from informational texts to support analysis, reflection, and research.

REFERENCES

Pilot's Handbook of Aeronautical Knowledge: 9-1 through 9-6
AOPA articles: https://www.aopa.org/news-and-media/all-news/1998/march/flight-training-magazine/continuing-ed
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